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PHYSIOGRAPHIC NOTES.

RECENT PAPERS ON NIAGARA.—The Niagara River continues to be a theme for investigation; and one of the most admirable studies upon this interesting problem is a recent paper by Taylor (*Bull. Geol. Soc. Amer.*, IX., 1898, 59-84). After describing the gorge, and calling attention to the alternation of broad and narrow sections, he correlates them with variations in the outflow of the Great Lakes. Taylor believes that the time of formation of the Whirlpool Rapids section coincides with the period of overflow of the upper Great Lakes across the Nipissing pass and into the Ottawa River, by which Niagara was reduced to a tiny stream, draining merely the area of Lake Erie.

This influence of variation in water volume, first suggested by Gilbert, and later elaborated by Spencer, is now made still more definite by Taylor's discussion, in which he argues that, because of the diminished volume, the time required for the formation of this narrow section of the gorge was very much greater than would have been required at the present rate of retreat of Niagara Falls. This then lengthens the age of Niagara gorge to probably 50,000 years, though Taylor admits that it may have been as low as 35,000 years, as estimated by Spencer upon similar grounds.

While this paper of Taylor's must be considered in the future studies, his conclusion cannot at present take rank as more than an hypothesis. Already arguments have been brought against it, as, for instance, by Wright (*Proc. Amer. Assoc. Adv. Sci.* 1898, XXVII, 299-300), who shows that the lower part of the gorge is not much more weathered than the upper part, as one would expect if the lower portion is from 35,000 to 50,000 years older than the upper.

In the same volume with Taylor's paper is one by Upham (*Bull. Geol. Soc. Amer.*, IX, 1898, 101-110), where the facts are stated in a similar way to those by Taylor, but with markedly less stress placed upon the time of overflow across the Nipissing pass. Moreover, instead of ascribing the narrow Whirlpool gorge to diminished water volume, Upham accepts Pohlman's idea that it really represents an interglacial or preglacial valley, which the modern Niagara very rapidly swept clear of drift. Upon the basis of this argument Upham reaches the common conclusion that the age of the gorge is from 5,000 to 10,000 years.

So the longer the investigation of Niagara continues, the less clearly we seem to approach a definite result; and we must for the present believe that Niagara River is not a good chronometer. It is possible that future investigations will clear up some of the difficulties, but the present aspect is far from encouraging.

FIFTEENTH ANNUAL REPORT OF NEW YORK GEOLOGICAL SURVEY.—The State Geological Survey of New York has contributed very little to our knowledge of the physiography of the State. This is well illustrated in the last annual volume (Fifteenth Annual, 1897, 738 pp.), a rather ponderous book, with unnecessarily wide margins, but with splendid paper and typography. The lack of appreciation of physiographic features is indicated by the fact that the geology of the State is still treated in large part upon the old-fashioned method of county divisions. Geologic and physiographic problems do not end at county boundaries.

As a contribution to the stratigraphic and economic geology of the State this report of course takes prominent rank; but the physiographer will find little to interest him, notwithstanding the richness of the opportunity.

THE PALISADES AND THE TRAPS OF NEW JERSEY.—By way of contrast, reference may be made to the reports of the Geological Survey of the neighboring State of New Jersey, which has published Salisbury's admirable report on the Physical Geography of the State. Also in the last Annual Report (for 1897, pp. 23-150) there is a valuable physiographic contribution by Kümmel, who describes the geology of the Red Sandstone belt of Triassic, or Newark, age—a series of beds of sandy rock which were apparently deposited in shallow estuaries that were subsiding as the sediment accumulated.

Into these beds sheets of basaltic lava were *intruded*, as, for instance, at the Palisades, where the lavas have a width of from 700 to 875 feet. In other places, as in the region near Paterson, the lava was *poured out* in the form of surface flows. These outflows occurred late in the Newark time, and the intrusions seem to have come somewhat later still.

There occurred an elevation after this volcanic period, and accompanying it the rocks were slightly folded and considerably faulted, which caused a certain measure of tilting. After this period of uplift, there was a long time of denudation, which Kümmel believes to have culminated in the development of a peneplain. By a later uplift and dissection, the harder rocks have been etched into relief, so that they now stand above the region in the form of hills.

The Report contains many interesting points of geology and physiography in addition to those mentioned here.

RECENT STUDIES OF ATOLLS.—A great deal of interest is attached to the investigations that are being carried on by English geologists concerning the true origin of the isolated coral atolls of the open ocean. For instance, Bonney (*Nature*, Vol. 59, 1898, p. 29) announces that the boring at Funafuti has reached a depth of 987 feet and is still in limestone. However, according to Agassiz (*Amer. Journ. Sci.*, CLVI, 1898, 165-167), the borings now being made are not likely to definitely settle the question of the origin of these islands, as has been hoped. In his studies in the Fiji Islands, Agassiz finds *elevated* reefs of limestone of late Tertiary age, and states that the coral reef itself forms only a relatively thin crust upon a platform of submarine erosion. This being the case, borings made through the coral and into the older limestone may fail to reveal the real differences that exist, so that, by including the Tertiary limestone, it may be assumed that there has been a recent subsidence of very much greater extent than has really occurred.

FRANZ JOSEF LAND.—In the *Quarterly Journal of the Geological Society* (Vol. LIV, pp. 620-645), Dr. Kœttlitz discusses the geology of Franz Joseph Land, and calls attention to some interesting physiographic features. He finds raised beaches to a height at least 400 feet above the sea, and drift wood and whale bones at levels of 90 to 100 feet, while the entire skeleton of a seal was discovered at a height of between 300 and 400 feet.

The sedimentary rocks of the land are Jurassic, and they are in many places covered with basaltic lava flows, which Dr. Kœttlitz assigns to Jurassic instead of Tertiary age, as has been supposed. Over much of the land, as is well known, there are glaciers, the covering of ice being so thin, however, that the rocks frequently protrude.

LAKE CHELAN, WASHINGTON.—Gannett (*Nat. Geog. Mag.*, IX, 1898, 417-428) has given us a description of the very interesting and beautiful Lake Chelan, in Washington, which is tributary to the Columbia. This lake is from 50 to 60 miles long, with a width of from one-half to one mile, or a little more in places. The walls of the valley rise at an angle of from 40° to 45°, directly out of the water, reaching an elevation of from 4,000 to 5,000 feet above the lake, which has a depth of 1,400 feet, reaching 300 feet below sea level. There is evidence that the valley has been occupied by a

deep glacier at least 100 miles long, and Gannett explains the lake as the result of a terminal moraine dam. While there is doubtless evidence of the existence of such a dam *at the surface*, it seems at this distance exceedingly improbable that there has been accumulated a morainic dam 1,400 feet in height. It would be distinctly unusual, and a lake of this nature would seem to be more probably due to ice erosion than to mere damming. Another possible origin is that of dam folding or faulting, and both of these must be eliminated before the moraine dam explanation can be accepted.

THE CINCINNATI ARCH.—It has been quite customary to consider the broad dome of the Cincinnati arch in the Ohio valley as representative of an ancient Silurian island. Miller (*Amer. Geol.* XXII, 1898, 78-85) argues against this current assumption, and ascribes the conditions in that region, not to lack of deposit, because of land conditions during the Silurian, but to later denudation, and concludes that the Silurian island must henceforth "take rank as a geological myth."

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